# **Attachment 5**

Dieback Management Plan



# Phytophthora Dieback Management Plan

Department of Defence – Muchea Air Weapons Range





Tel: 0400113093 • PO Box 5573, Albany, WA, 6332 • Email: info@gsbiologic.com.au • www.gsbiologic.com.au



## **Phytophthora Dieback Management Plan**

Great Southern Bio Logic Pty Ltd ACN: 149 403 378 ABN: 94 330 372 841

Department of Defence – Muchea Air Weapons Range

27 / 07 / 2021

Prepared for:

GHD

Project reference: GSBL434-PDMP\_ADF\_MAWR\_2021-V1

Written and submitted by

**Jeremy Spencer** 

Senior Environmental Scientist





## **Record of Distribution**

No. of copies	Report File Name	Report Status	Date	Prepared for:	Initials
1	GSBL434- PDMP_ADF_MAWR_2021	V1	27 July 2021	GHD	JS
1	GSBL434- PDMP_ADF_MAWR_2021	V1	27 July 2021	GSBL	JS





### **EXECUTIVE SUMMARY**

The Australian Government, Department of Defence (DoD) operates and maintains several properties that provide for a range of operational and training activities in the State of Western Australia (WA). These include the Muchea Air Weapons Range (MAWR) which is composed predominantly of native vegetation, covering approximately 9,600 ha and is used as a training ground for DoD staff.

As land manager, the DoD is responsible for the management of native vegetation, including assessment and management of the introduced plant disease Phytophthora Dieback. Phytophthora Dieback is an introduced soil borne plant pathogen that affects up to 40% of native plant species within Western Australia. The MAWR and adjoining areas of remnant vegetation to the north represent a significant intact remnant *Banksia* woodland that is highly susceptible to the pathogen and also provides a significant foraging and habitat resource for nature fauna communities.

In accordance with its responsibilities the DoD, through departmental management contractors, have regularly engaged consultants to undertake Phytophthora Dieback assessments and develop Phytophthora Dieback Management Plans. There have been multiple previous assessments of the MAWR and over 50 soil and tissue samples have been collected. From these samples, 11 positive results have been returned, confirming the presence of the plant pathogen in several locations across the MAWR. The majority of the positive samples have identified *Phytophthora cinnamomi* however *P. arenaria* has also been identified.

The current assessment, completed in December 2020, applied the Broad Area survey method across the entire MAWR with a focus on the previously confirmed infested sites. The 2020 assessment included the collection of 17 soil and tissue samples, of which two returned positive results for *Phytophthora cinnamomi* while the remainder were negative. These results were used to classify vegetation in accordance with current WA best practice Phytophthora Dieback practices (DBAC 2015). This has resulted in the reclassification of previous occurrence mapping that was inconsistent with current WA best practice standards.

The data produced using this assessment provides planning level information that shows significant areas of protectable vegetation occur across the MAWR that can be protected from introduction and spread of the disease by implementing appropriate management practices. Prior to undertaking any disturbance activities that are likely to result in soil disturbance, a risk assessment must be completed. Any activities that are likely to present a low risk can proceed with the application of basic Dieback Management practices that centre around good vehicle and equipment hygiene, and the Clean on Entry standard that is to be applied before entering areas of remnant vegetation.

Any disturbance activity that is classified as having a moderate to high risk of disturbing soil must be preceded by a detailed site assessment targeted in the specific project area. The information from the detailed, targeted assessment must then be used to develop an activity specific Phytophthora Dieback Management Plan.





### CONTENTS

EX	ECUTIVE SUMMARY	I	
1	INTRODUCTION	5	
1.1	Background	5	
1.2	Objectives	5	
1.3	Scope of Works	5	
<b>1.4</b> 1. 1. 1. 1.	Site Characteristics4.1Study Area4.2Ecological values4.3Land Use4.4Climate	<b>6</b> 6 8 9	
2	PHYTOPHTHORA DIEBACK REGULATION AND MANAGEMENT	10	
2.1	Legislative Framework	10	
<b>2.2</b> 2.	Current Western Australian Management 2.1 Phytophthora Dieback Assessment	<b>10</b> 10	
2.3	Phytophthora Dieback Management across Department of Defence Lands	12	
3	ASSESSMENT METHOD	13	
3.1	Desktop Interpretation	13	
<b>3.2</b> 3.	Field Survey 2.1 Sampling Program	<b>13</b> 14	
4	RESULTS	15	
<b>4.1</b> 4. 4.	Desktop1.1Previous interpretation data1.2Assessable remnant native vegetation	<b>15</b> 15 15	
4.2	Broad Area survey	16	
4.3	Sample Program	16	
4.4	Protectable Areas	17	
4.5 Limitation of results			
5	DISCUSSION	19	
5.1	Environmental Conditions required for Assessment	19	





5.2	Previous Surveys	19	
5.3	Current 2020/21 Assessment	20	
6	PHYTOPHTHORA DIEBACK MANAGEMENT PLAN	23	
6.1	Objectives of the PDMP	23	
6.2	Basic Phytophthora Dieback Management	23	
<b>6.3</b> 6. 6. 6. 6.	Disease Risk3.1Soil Moisture3.2Activity Type3.3Consequence of introducing Phytophthora Dieback3.4Calculation of Activity Risk	<b>24</b> 24 26 26	
6.4	Clean on Entry Locations	28	
<b>6.5</b> 6. 6.	Phytophthora Dieback Signage5.1Dieback Protection Area Signs5.2Dieback Status Markers	<b>29</b> 30 30	
7	RECOMMENDATIONS	32	
7.1	Phytophthora Dieback Survey	32	
7.2	Signage	32	
7.3	Basic Raw Materials	32	
7.4	Phytophthora Dieback Management	33	
8	REFERENCES 3		
9	REPORT DISCLAIMER	35	





## LIST OF ATTACHMENTS

#### Tables

Table 1:	Summary of key statistics from the MAWR Study Area
Table 2:	Example activities undertaken at the MAWR and associated Phytophthora Dieback risk
Table 3:	Predicted impact rating, assessment scale and associated consequence rating
Table 4:	Risk matrix for activities performed in Dry Soil Conditions
Table 5:	Risk matrix for activities performed in Moist Soil Conditions
Table 6:	Risk matrix for activities performed in Wet Soil Conditions
Table 7:	Requirements for undertaking hygiene inspections when crossing hygiene category boundaries

#### Figures

Figure 1:	Muchea Air Weapons Range – Regional Location
Figure 2a:	Muchea Air Weapons Range - West - Phytophthora Dieback Occurrence Broad Area Survey showing Sample Locations and Unprotectable Areas
Figure 2b:	Muchea Air Weapons Range - East - Phytophthora Dieback Occurrence Broad Area Survey showing Sample Locations and Unprotectable Areas
Figure 3:	Muchea Air Weapons Range - Dieback Signage and Clean on Entry Points
Figure 4a:	Muchea Air Weapons Range - West - Infested Area Signage and Clean on Entry Points
Figure 4b:	Muchea Air Weapons Range - East - Infested Area Signage and Clean on Entry Points
Appendices	
Appendix A:	VHS soil and tissue sample analysis report

Appendix B: Example vehicle hygiene inspection form





## **1 INTRODUCTION**

#### 1.1 Background

The Australian Government, Department of Defence (DoD) operates and maintains several properties that provide for a range of operational and training activities in the State of Western Australia (WA). The vegetation cover of the properties ranges from being totally cleared to including large tracts of forest and woodland communities representing regionally significant native vegetation. The Muchea Air Weapons Range (MAWR) site is composed predominantly of native vegetation, covering approximately 9,600 hectares (ha) and is used as a training ground for DoD staff.

As land manager, the DoD is responsible for the management of native vegetation, including assessment and management of the introduced plant disease Phytophthora Dieback. Phytophthora Dieback is an introduced soil borne plant pathogen that affects up to 40% of native plant species within Western Australia. Most commonly the disease is caused by *Phytophthora cinnamomi*, however, other introduced species such as *P. multivora* can also have significant impact under specific environmental conditions.

Phytophthora Dieback is commonly introduced to an area through infested soils carried as basic raw materials or on vehicles, plant and machinery, or by humans on foot. In favourable conditions for the pathogen, infestation can result in the collapse of entire vegetation communities. Once introduced to an area, Phytophthora Dieback will spread through further human vectoring and also via water movement and root to root contact, resulting in extensive infestations which may cause significant impact to native vegetation communities. There is currently no practical method of eradication of the pathogen.

#### 1.2 Objectives

The objectives of this 2021 Phytophthora Dieback Management Plan (PDMP) are to:

- review and update the Phytophthora Dieback occurrence data developed during previous assessments performed in 2012, 2013 and 2016.
- review and update the 2016 MAWR Dieback Management Plan (ELA 2016) to incorporate the revised Phytophthora Dieback occurrence data and current Phytophthora Dieback management protocols and best practice.
- develop MAWR specific management controls to reduce the spread of Phytophthora Dieback within the site and to other Defence facilities.

The aim of this Phytophthora Dieback Management Plan is to mitigate the potential impacts of Phytophthora Dieback on native vegetation within the MAWR with consideration for operational requirements. This plan, in association with the Regional Dieback Management Plan (Ecoscape & Glevan 2012), forms part of DoD's national Environmental Management System (EMS).

#### 1.3 Scope of Works

The scope works performed to achieve the PDMP objectives included:

 desktop assessment of the MAWR including review of all previous disease occurrence assessments and PDMPs





- accurately mapping current disease occurrence boundaries across linear infrastructure in areas previously reported as "Confirmed Infested" or "Areas of Concern"
- Broad Area survey across areas previously reported as "uninfested/unknown" disease status
- review of the condition and location of Phytophthora Dieback signage where signage is in place
- collection of field data using a hand-held GPS unit. Field data included survey effort track files, disease evidence points, soil and tissue sample locations and mapped disease boundaries
- development of this PDMP inclusive of current (2020/21) disease occurrence data and recommendations for ongoing hygiene and signage requirements; and
- development and supply of associated spatial data in accordance with Index of Biodiversity Surveys for Assessment (IBSA) requirements (NB: there is currently no IBSA template for Dieback assessment data. To meet this requirement, the IBSA template for 1\_Survey details has been adapted).

The Broad Area survey method is defined in *Phytophthora Dieback Interpreters Manual for Land managed by the department* (DBCA, 2015). Broad Area survey data provides planning and management information only.

#### 1.4 Site Characteristics

#### 1.4.1 Study Area

The MAWR is located approximately 11 km west of Bullsbrook and 45 km north of Perth, covering an area of approximately 9,600 ha (Figure 1). The site is bounded by Neaves Road to the south, the Muchea townsite to the east and private agricultural and market garden land to the west. To the north and west there is a continuous expanse of remnant native vegetation that includes RAAF Gingin.

The MAWR is partially fenced, however, there are several unfenced areas with access tracks along the western side. At the time of assessment, fence construction works were underway around the aerial bombing range in the south. Apart from cleared tracks and limited site infrastructure including the aerial bombing range, the MAWR is composed of undisturbed remnant native vegetation. There is a Western Power transmission line running roughly north south across the western side of the MAWR and there is evidence of unauthorized use of the site by recreational off-road drivers.

#### 1.4.2 Ecological values

#### 1.4.2.1 Vegetation

The most recent vegetation assessment was undertaken by Woodman Environmental in 2018. This assessment was a desktop and reconnaissance survey only. The search of DBCA's TEC and PEC database identified five significant vegetation types within the vicinity of the Study Area, including one TEC and four PECs. Of these significant vegetation types, three occur within the Study Area.

During the reconnaissance survey the following vegetation communities were identified. It must be noted the reconnaissance survey did not cover the entire MAWR:

• *Banksia attenuata / Banksia menziesii* woodland over mixed shrublands dominated by *Adenanthos cygnorum* and *Scholtzia* sp. on dunes and slopes on grey sand;





- *Eucalyptus todtiana / Banksia attenuata / Banksia menziesii* woodland over mixed shrublands dominated by *Hibbertia hypericoides* on dunes and slopes on grey sand;
- *Banksia attenuata / Banksia ilicifolia* woodlands on flats and depressions on grey sand or sandy loam;
- Melaleuca preissiana forest in depressions on grey sand or sandy loam.

These vegetation descriptions have not been developed by Great Southern Bio Logic and the field survey performed by Great Southern Bio Logic did not classify vegetation communities. However observations of the vegetation suggest that the *Banksia* woodlands across the MAWR are consistent with the definition of the *Banksia* woodlands of the Swan Coastal Plain TEC which was listed under the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act), effective September 2016. As reported by Woodman Environmental in 2018, the *Banksia* woodlands of the Swan Coastal Plain TEC is known to occur across the MAWR.

*Banksia* woodlands are the most susceptible vegetation types on the Swan Coastal Plain to Dieback, therefore making the majority of the site at high risk of Dieback infestation (Cahill et al. 2008).

#### 1.4.2.2 Flora

Several flora surveys have been previously conducted at the site, the most recent being a desktop assessment performed by Woodman Environmental in 2018. This assessment reviewed the WA Herbarium and Threatened and Priority Flora databases to identify species recorded within 10km of the site but did not include a detailed site survey.

The most intensive flora assessment was conducted over two seasons by Ecologia in 2003. The survey identified 213 flora species during spring and autumn surveys comprising 41 families and 128 genera (Ecologia 2004). The most common families recorded at the site are also families that contain the greatest proportion of species susceptible to *Phytophthora cinnamomi*:

- Myrtaceae (30 taxa)
- Papilionaceae (now Fabaceae) (18 taxa)
- Proteaceae (17 taxa)
- Epacridaceae (15 taxa).

One flora species listed under the EPBC Act and three Priority flora species as listed by the DBCA have been recorded from the site (Ecologia 2004):

- Darwinia foetida (Critically Endangered under the EPBC Act)
- Conostylis bracteata (Priority 3)
- Jacksonia sericea (Priority 4)
- Conostephium magnum (Priority 4).

None of these species are listed by as being susceptible to *Phytophthora cinnamomi* (Groves, Hardy and McComb 2009); however other species of *Darwinia, Jacksonia* and *Conostephium* are susceptible. As the known list of susceptible species is not exhaustive and only addresses susceptibility to *P. cinnamomi* (Groves, Hardy and McComb 2009), other forms of Dieback within the site could pose a threat to these conservation significant species. Resistant species can still be impacted by Dieback, as changes in





vegetation structure and density as a result of Dieback infestation can cause decline in both susceptible and resistant species (Wills 1993).

#### 1.4.2.3 Fauna

A previous two phase fauna survey of the site recorded two amphibian, 29 reptile, 52 bird, three nonvolant native mammal and five bat species (WA Museum 2003). It is likely a number of additional species are present within the site that were not observed during the survey (WA Museum 2003). One species recorded during the fauna survey is listed under the EPBC Act as Threatened and one as Priority by the DBCA:

- *Calyptorhynchus latirostris* (Carnaby's Cockatoo; Endangered under the EPBC Act)
- Isoodon fusciventer (Quenda; Priority 4).

In 2015 ELA conducted a fauna survey within a small portion of the AWR (ELA 2015) providing information on habitat values. The Banksia woodlands across the site were identified as representing high value foraging habitat for the Threatened Carnaby's Cockatoo.

#### 1.4.3 Land Use

Activities that occur within Defence sites are separated into nine key groups (Ecoscape & Glevan 2012), some of which are considered high risk activities for the spread and/or introduction of Phytophthora Dieback as assessed by the Defence Environmental Risk Tool (DERT). All nine activity groups are considered relevant to the MAWR:

- Construction / development
- Liquid waste management / disposal
- Demolition / decommissioning
- Maintenance
- Non-Defence activities
- Solid waste management / disposal
- Site operations
- Storage
- Training.

The MAWR is primarily used by the Royal Australian Airforce (RAAF) for continuation training (bombing practice) for aircrew instruction operating out of the RAAF Pearce base. Other uses include small arms training at a 300 m small arms shooting range used by the Army, RAAF and WA Police Service. Australian Defence Force (ADF) units also use the MAWR for a variety of training activities, including air to ground gunnery, driver training and general field training activities at a range of levels from individual infantry sections upwards (URS 2001a). The main impacts from Defence Activities are generally limited to the south, west and central-north-east areas. Site activities and associated impacts are generally limited to on site ranges, fire breaks and access tracks.





#### 1.4.4 Climate

The Bureau of Meteorology (BoM) broadly classifies the climate across the south west region of Western Australia as warm summers with cold winters. The BoM maintains a network of weather stations across Australia to record weather data. The nearest station to the project area with detailed annual average data is the Muchea Tree Farm. The long-term average annual rainfall data from the Muchea Tree Farm shows that the annual average rainfall is 740.6 mm/yr, ranging from a minimum of 379.2 mm/yr to a maximum of 1091.4 mm/yr BoM 2021).

The closest BoM weather station recording temperature data is located at Pearce RAAF. Records from this station show that the highest average maximum temperature is 33.5 °C in January while the lowest average minimum temperature is 17.9 °C in June (BoM 2021).

These are important figures as the accepted distribution of *Phytophthora* is generally restricted by the 400 mm isohyet with distribution in the 400 - 600 mm/yr zone further restricted to sites with high summer rainfall averages or associated with water gaining sites. Based on the BoM climate classification and rainfall data the MAWR experiences suitable climatic conditions for *Phytophthora* to have an impact, however, due to high summer temperatures and some years experiencing marginal rainfall it is unlikely that significant impact associated with Phytophthora Dieback will occur.





## 2 PHYTOPHTHORA DIEBACK REGULATION AND MANAGEMENT

#### 2.1 Legislative Framework

The MAWR is located on Commonwealth land and is therefore governed under Commonwealth legislation. The biodiversity conservation provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) place special obligations on Commonwealth agencies to comply with policy prepared under the Act in relation to species, habitat and protected areas. The EPBC Act lists Phytophthora Dieback as a key threatening process that poses a significant threat to biodiversity values within Australia. Policy prepared under the EPBC Act includes the national *Threat Abatement Plan for disease in natural ecosystems caused by Phytophthora cinnamomi* (TAP) (Commonwealth of Australia (CoA) 2018), and recovery plans for threatened flora species and communities that include Dieback management considerations.

The TAP (CoA 2018) establishes a national framework to guide and coordinate Australia's response to Phytophthora Dieback. This identifies research, management and other actions to mitigate impact of the pathogen to natural values.

In Western Australia, Phytophthora Dieback management is regulated by the Department of Biodiversity Conservation and Attractions (DBCA) through implementation of the *Biodiversity Conservation Act* (2016) and the *Conservation and Land Management Act* (1984). The DBCA also has certain statutory obligations under the *Biosecurity and Agriculture Management Act* (2007) concerning biosecurity matters generally, including *Phytophthora*.

#### 2.2 Current Western Australian Management

In Western Australia, assessment and management of Phytophthora Dieback is overseen by the DBCA who regulate standards, implementation of hygiene and maintain a registration system for appropriately qualified Phytophthora Dieback Interpreters. The Dieback Working Group also contribute to Phytophthora Dieback management in Western Australia through the development and distribution of management guidelines for community and industry groups. *Standard Dieback Signage - protocols for use* (Project Dieback, 2008) guides standardised signage across tenures to raise awareness and mitigate disease spread.

#### 2.2.1 Phytophthora Dieback Assessment

The *Phytophthora Dieback Interpreters Manual for Lands managed by the Department* (DBCA 2015) presents defined Phytophthora Dieback assessment methodologies. It identifies several assessment methods that provide for either linear or non-linear assessment. Assessment methods may vary depending on the project type, disturbance activity and objectives of the assessment.

While this document refers to lands managed by the DBCA, it is recognised in Western Australia as Industry best practice and is routinely applied to State agency and private estate.

DBCA (2015) guidelines identify six potential disease hygiene categories based on presence/absence of the disease, or the unknown disease status of an area. An area can have an unknown disease status if the vegetation at the site is not susceptible to the disease or it cannot be assessed because of disturbance, e.g., fire. As a result, even if the pathogen is present, there may be no interpretable signs.





Only areas with suitable remnant native vegetation can be assessed. Areas that have been cleared or significantly altered are excluded from survey. In some cases, small, excluded areas may be afforded a hygiene category if they are small enough to be influenced by adjacent surveyed vegetation or situated such that topographical influences can be used to determine disease presence or absence.

The six possible disease categories are listed and described below:

- 1. **Infested** Areas a registered interpreter determines to have plant disease symptoms consistent with the presence of *Phytophthora cinnamomi*.
- 2. Uninfested Areas determined by a registered interpreter to be free of plant disease symptoms that indicate the presence of *P. cinnamomi*.
- 3. **Uninterpretable** Natural, undisturbed areas where susceptible plants are absent, or are too few to make a determination of the presence or absence of *P. cinnamomi*.
- **4. Temporarily uninterpretable** Areas where disease presence or absence cannot be determined due to a level and type of site disturbance that will recover within the short to medium term, e.g., fire, rehabilitation.
- 5. **Not Yet Resolved** *Phytophthora* occurrence diagnosis cannot be made because of inconsistent or incomplete evidence (including sample results). The category is only to be used in low interpretability zones (400 mm to 600 mm rainfall range).
- 6. **Disease Risk Roads (DRR)** Interpreters will use the DRR category to show the disease status is unknown because of suspected or apparent recent use under unknown hygiene conditions.

Following the determination of disease categories, protectable areas are identified to determine areas that are likely to remain free from the disease with the application of appropriate disease hygiene as required.

Protectable areas are defined in the *Phytophthora Dieback Interpreters Manual for Lands managed by the Department* (2015) as areas that:

- have greater than 600 mm of annual rainfall or are water gaining sites in the 400 mm 600 mm rainfall zone;
- are determined to be free from *Phytophthora cinnamomi* by a DBCA registered disease interpreter. Uninterpretable areas may be classified as protectable;
- comprehensive transect survey areas that are positioned in the landscape and are of sufficient size that they will not be engulfed by *Phytophthora* via autonomous spread. Such an area is defined as being greater than 4 ha with a minimum axis greater than 100 m, and not down slope of an infested area;
- linear assessment areas longer than 100 m after the application of appropriate disease category buffers;
- have controllable human vectors; and/or
- include high conservation and/or socio-economic values.

In some cases, disease classifications may require changing following re-assessment. This may be the result of recent disease introduction or spread into areas previously classified as uninfested. In some





situations, an incorrect diagnosis of infested may have been applied to an area. This classification can be revised with suitable visual evidence demonstrating there is no disease activity and the collection of at least three negative samples, if suitable susceptible species deaths occur (DBCA 2015).

#### 2.3 Phytophthora Dieback Management across Department of Defence Lands

The Department of Defence undertakes Environmental management across its sites in accordance with a national EMS which incorporates the management of Phytophthora Dieback. Environmental management across specific sites is guided by either Training Area Standing Orders (TASO), Range Standing Orders (RSO) or Base Standing Instructions (BSI), depending on the status of the site as a Training Area, Range or Base.

A TASO, RSO or BSI informs the need for environmental restrictions and controls that are required for specific DoD activities as well as identifying activities that will require specific environmental approval. In a situation requiring specific approvals, an environmental risk assessment is performed and when complete, the Environment and Sustainability Manager will either issue an Environmental Clearance Certificate for the activity or identify the activity as high risk, requiring a detailed environmental impact assessment to be performed.

In situations requiring a detailed environmental impact assessment, or if activities are likely to be considered under the EPBC Act, the activity will be referred to the federal environmental branch in Canberra. Such projects require detailed project design and planning that may involve site specific environmental assessments and project specific management to mitigate potential impacts.





## **3 ASSESSMENT METHOD**

In accordance with the agreed project scope of works, the MAWR field survey was undertaken using a survey methodology referred to as Broad Area survey, with accurate mapping of disease occurrence in areas previously reported as "Infested" or "Areas of Concern".

The Broad Area survey method is consistent with the DBCA guideline, *Phytophthora Dieback Interpreters Manual for Lands managed by the Department* (2015). The information produced using this method of survey provides planning level disease hygiene information for application across all assessable vegetation within the MAWR.

If on ground soil disturbance activities are to be undertaken at the MAWR, then a risk assessment is required, and operational scale disease assessments may be necessary. Due to the mobility of the disease though autonomous spread and human vectoring, all disease occurrence data has a limited life of 12 months, after which time disease boundaries must be re-checked prior to soil disturbance activities. A summary of key survey activities performed across the MAWR is provided below.

#### 3.1 Desktop Interpretation

The MAWR was subject to an initial desktop assessment involving a review of available previous assessment reports and spatial data (ELA 2016, 2014), the Vegetation Health Service (VHS) *Phytophthora* sample database and examination of available aerial imagery to assess:

- the extent of assessable remnant native vegetation occurring within the MAWR
- the known occurrence of Phytophthora Dieback within or influential to the MAWR
- the occurrence of site specific or influential high risk disease vectors including but not limited to roads, creek lines and gravel pits and
- evidence of existing disease signatures such as areas of obvious vegetation decline.

#### 3.2 Field Survey

The Broad Area survey method involved assessment of linear disease occurrence along accessible tracks and other linear infrastructure, with an extrapolation of disease occurrence using topography, high-risk disease vectors and other influences. It should be noted that extrapolated areas were not subject to intensive ground coverage.

The survey was undertaken by a DBCA registered disease interpreter and included visual diagnosis of the disease within areas of assessable remnant vegetation within the assessment area. Visual diagnosis involves identification of susceptible species deaths occurring in patterns consistent with disease spread, such as radiating from an identified vector. Plant deaths associated with *Phytophthora* are rapid and complete rather than partial. Further, the disease presents a chronologic pattern of deaths, with the oldest deaths closest to the disease vector and most recent deaths further from the vector, forming a disease front.

Following the visual diagnosis of the disease, infested areas are mapped along roads, tracks and other high risk disease vectors, while small infestations may be mapped in their entirety. Areas of vegetation considered to be uninfested or uninterpretable are not classified, as small undetected infestations may occur within them but remain undetectable due to the reduced survey effort associated with this method





of survey. For management purposes these areas should be considered protectable from future introduction or spread of the disease.

This method may only be used for non-operational mapping to identify obvious infested sites. It is usually carried out in very large areas where a comprehensive assessment would be prohibitively expensive and there are no impending soil disturbance activities anticipated within 12 months. The resulting data is generally used for broadscale planning and targeting of areas for comprehensive assessment, if required.

Field data including disease presence and vegetation information was collected using a hand-held GPS unit and converted to ArcGIS<sup>™</sup> shapefiles. Collected field data included all sample locations, a point file of all identified individual plant deaths attributed to *Phytophthora*, disease hygiene boundaries and track files of the area covered during survey.

#### 3.2.1 Sampling Program

Visual diagnosis was supported by laboratory assessment of soil and tissue samples. As defined in *Phytophthora Dieback Interpreters Manual for Lands managed by the Department* (DBCA 2015), soil and tissue samples were collected from representative individual disease indicator species deaths located across the site. Sample results were then used to inform the likely cause of death of other disease indicator species exhibiting similar symptoms in similar vegetation units across the assessment area.

The sampling strategy undertaken was also designed to distinguish between death by Phytophthora Dieback and drought. This was particularly intended to test previously applied disease hygiene categories of "infested" and "areas of concern".

Sampling for Phytophthora Dieback includes the collection of soil and tissue samples from fresh deaths of plants considered to be reliable indicator species of *Phytophthora* expression. The samples are labelled and placed into heavy duty plastic bags before being forwarded to the VHS laboratory for analysis.

All sampling undertaken was performed in accordance with the methods described in the *Phytophthora Dieback Interpreters Manual for Lands managed by the Department* (DBCA, 2015). A single sample was collected from an area known to be infested with *Phytophthora cinnamomi* through the collection of a previous positive sample (ELA 2016). This sample was collected as control sample intended to test the suitability of soil moisture for sample analysis.





## 4 **RESULTS**

The MAWR including regional location is shown in Figure 1. Disease occurrence, sampling data and the location of protectable areas across the MAWR are shown in Figures 2a and 2b. The results of the protectability assessment are presented in Section 4.4 and these identified protectable areas that will require the application of appropriate hygiene during operational soil movement activities. Appendix A presents the VHS laboratory certificates for all samples collected during the assessment.

#### 4.1 Desktop

#### 4.1.1 Previous interpretation data

There have been several previous Phytophthora Dieback assessments conducted at MAWR prior to the current 2020/21 survey. These include previous sampling events conducted on behalf of the DoD in 2012, 2013 and 2016 (ELA 2013 and 2016). None of the previous ELA surveys have been undertaken by an experienced Phytophthora Dieback interpreter registered by the DBCA.

A total of 53 historic samples have been collected during previous surveys undertaken on behalf of the DoD for Phytophthora Dieback Management Plans. From these there have been a total of three positive recoveries of *P. cinnamomi* and two recoveries of *P. arenaria*. In addition to the DoD surveys there have been surveys performed by external groups that have collected additional positive recoveries including two previously unreported recoveries of *P. cinnamomi* along the main access track in the east of the MAWR from the Muchea townsite, collected in 2018. A third previously unreported record of *P. cinnamomi* is located to the west of the bombing range in the south of the MAWR. This sample was collected in 2000. All historic positive recoveries are shown on Figures 2a and 2b.

The 2016 Phytophthora Dieback Management Plan (ELA 2016) uses the results from all previous DoD assessments to classify vegetation across the MAWR as Confirmed Infested, Area of Concern or Uninterpretable/Uninfested. These classifications are not consistent with the current DBCA guidelines for the detection and management of Phytophthora Dieback.

#### 4.1.2 Assessable remnant native vegetation

As defined in the assessment criteria presented in Section 3, only areas with suitable remnant native vegetation can be assessed. Areas that have been cleared or significantly altered are excluded from assessment (i.e. those classed as degraded or completely degraded under the Keighery (1994) condition scale).





#### 4.2 Broad Area survey

A summary of key statistics is presented in Table 1 below: Table 1: Summary of key statistics from the MAWR Study Area

MAWR Study Area – Summary of Key Statistics			
Area of Assessable Vegetation	9601 ha		
Infested Vegetation	50.1 ha		
Protectable Vegetation	9551 ha		
Unprotectable Vegetation	50.1 ha		

Vegetation across the entire MAWR showed evidence of recent and historic impact consistent with the expression of drought stress with many apparent plant deaths re-shooting new growth from the base of the plant stem. In areas where the collection of positive samples has confirmed the presence of *Phytophthora*, disease expression consistent with the development of a disease infestation, spreading from a high-risk disease vector, was observed.

Susceptible species used to determine the occurrence of Phytophthora Dieback included:

• Banksia attenuata

Banksia menziesii

Banksia ilicifolia

• Xanthorrhoea preissii

Following the current assessment seven separate infestations have been identified, as shown on Figures 2a and 2b. Results of soil and tissue samples have been used in collaboration with visual disease expression, observed by a registered Phytophthora Dieback interpreter to re-classify five areas previously incorrectly classified as either confirmed infested or areas of concern.

A detailed assessment of the previously unreported VHS database record of *P. cinnamomi* located to the west of the bombing range in the south of the MAWR, sampled in 2000 was undertaken and additional sampling conducted. The database visually displayed the record in one location, while plotting of the listed coordinates from the original sample record, portrayed the sample 200 m to the southwest. No disease expression consistent with impact by Phytophthora Dieback was identified around either position and all suspect areas within close proximity were sampled and returned negative results. Due to the age of the sample, collected prior to the widespread use of GPS in field surveys, it is possible that the historic record represents an inaccurate location, however, as it is recorded on the VHS positive sample database it has been included within the PDMP. As no actual presence of Phytophthora Dieback has been confirmed, the area around the plotted coordinate location has been reported as Yet to be Resolved. It does not impact current site use as it is situated approximately 200 m from the nearest track.

#### 4.3 Sample Program

All sample locations and results are presented in Figures 2a and 2b which also shows the locations of historic sample records. While negative samples do not conclusively confirm the absence of the disease, the high volume of historic and current negative sample results demonstrates a general absence of the





disease. Seventeen soil and tissue samples were collected from assessable vegetation within the MAWR Study Area in 2020.

The sampling strategy was intended to:

- confirm the impact of drought stress on vegetation communities that was observed broadly across the entire area
- determine the presence/absence of *Phytophthora* species associated with fresh deaths occurring within areas where vegetation impact was consistent with impact from *Phytophthora* and assess the influence of *Phytophthora* species associated with fresh deaths occurring within areas previously mapped as *Areas of Concern*.

Soil conditions at the time of survey were very dry, however, the BoM data from Muchea shows 94 mm of rainfall fell in the area during the month of November 2020, immediately preceding the survey dates. It is anticipated that these conditions would have created suitable conditions for Phytophthora Dieback to be active, and therefore recoverable from sample material, if it was present. To test the suitability of soil moisture and environmental conditions, Sample MAWR 1 was collected from a known *P. cinnamomi* infestation and returned a positive result for *P. cinnamomi*. This provides confidence in the sample results, however, false negative results do remain a potential.

In addition to the positive result from sample MAWR 1, a positive result for *P. cinnamomi* was also reported from Sample MAWR 11. The remainder of the results were negative for *Phytophthora*.

#### 4.4 **Protectable Areas**

Phytophthora Dieback is believed to be largely absent from the MAWR, however, due to the absence of comprehensive disease occurrence data, this status cannot be determined conclusively. In the absence of comprehensive Phytophthora Dieback occurrence data all non-infested vegetation situated upslope of known infestations is to be considered protectable from the introduction or spread of the disease (DBCA 2020). Vegetation assessed as infested cannot be protected from Phytophthora Dieback and all uninterpretable or uninfested vegetation situated downslope of known infestations are classified as unprotectable.

#### 4.5 Limitation of results

Phytophthora Dieback is a soil borne plant pathogen that spreads autonomously via root to root transmission, independently through the soil and also with the movement of water. The disease is also widely spread by human activities involving the movement of infested soil and plant material. As a result, the edge of a disease infestation is considered to be an actively spreading disease front, and all uninfested areas of vegetation that are associated with human vectors such as tracks and access ways are considered to be at risk of future infestation unless appropriate management is applied.

The disease occurrence data presented in this report is representative of the distribution of Phytophthora Dieback within assessable vegetation in the MAWR at the time of assessment based on Broad Area survey methods. It does not represent high confidence operational scale data. In accordance with DBCA guidelines (2015, 2020), operational scale data is required prior to any planned soil disturbance activities. Operational scale data is developed from disease occurrence surveys undertaken using either the Comprehensive Transect or Linear surveys methods which are defined in the *Phytophthora Dieback Interpreters Manual for Lands managed by the Department* (DBCA, 2015).





Phytophthora Dieback occurrence data is valid for a period of 12 months from the date of assessment. After 12 months a disease re-check assessment is required and after three years a full re-assessment of the survey area will be required.

Results are further limited by a former Rocket Projector Range situated along the gravelled access track extending from Archibald Road in the east of the MAWR. No access beyond the cleared track was undertaken in this area due to the risk of unexploded ordnances.





## 5 DISCUSSION

#### 5.1 Environmental Conditions required for Assessment

The spread of Phytophthora Dieback is dependent upon environmental conditions (moisture and temperature) and host availability. The variability of these factors produces an extremely wide range of disease syndromes in Western Australian vegetation communities. It is known that the impact of the disease may be greater in native vegetation in higher rainfall areas and the impact and distribution of infested areas is reduced in the lower rainfall zones. As identified in Section 1.4.4 the DBCA (2015, 2020) define the vulnerable zone for susceptibility to Phytophthora Dieback as all areas in the south west with average annual rainfall above 400 mm, with limitations to the disease expression occurring in the 400 mm – 600 mm isohyet zone. A study into the probability of disease infestation in upland areas of Western Australian forests found that the probability of the disease establishing in upland areas increases exponentially in areas receiving 900 mm or above of average annual rainfall (Blankendaal 1998).

The average annual rainfall for the MAWR is approximately 670 mm (BoM 2021) which places the site in the vulnerable zone but suggests that infestations are most likely to be limited to creek lines and gullies. The current assessment was undertaken in December 2020, however, higher than average rainfalls in November 2020 (82.2 mm) were considered suitable to provide sufficient soil moisture that would support observable disease expression in infested areas. Despite this, subsurface soil conditions were considered to be very dry at the time of survey.

#### 5.2 Previous Surveys

Several previous Phytophthora Dieback assessments have been conducted within the MAWR, however, some were limited in the area covered.

Previous sampling assessments have been conducted by ELA as part of MAWR Phytophthora Dieback Management Plans in 2012, 2013 and again in 2016. These assessments confirmed two infestations of *P. cinnamomi* along the 330 kV high voltage power line in the west of the MAWR and along McKinley Road to the north of the MAWR. Two additional occurrences of an endemic Phytophthora species, *P. arenaria*, were also recorded along the north-west boundary of the site and along McKinley Road.

From the VHS sample database it can be seen that the most recent previous survey was conducted in 2018. A detailed report from this assessment was not available for review as part of the current assessment and so the full scope of that project is unknown. The VHS data base shows two positive recoveries of *P. cinnamomi* along the gravelled access track that enters the MAWR from the Muchea townsite in east of the MAWR.

Another assessment of the MAWR was performed in 2008. This assessment can only be identified by records in the VHS positive sample recovery database. Because a detailed report from this assessment was not available for review, the full scope of that assessment is unknown. The records identified positive recoveries of *P. cinnamomi* along the Western Power Transmission line in the west of the MAWR.

The earliest assessment of the MAWR was performed in 2000. Again, this assessment can only be identified by positive sample recovery records in the VHS positive sample recovery database and there was no associated report available for review. The VHS database identifies one positive recovery of *P. cinnamomi* in the south west of the MAWR, approximately 1.3 km due west of the small arms firing





range. This historic recovery was not identified in any of the previous Phytophthora Dieback assessments or associated management plans.

None of the previous Phytophthora Dieback assessments undertaken on behalf of the DoD were undertaken by DBCA registered Phytophthora Dieback interpreters experienced in the identification of visual disease expression in native vegetation communities. Previous assessment disease occurrence classifications *Area of Concern* and *Confirmed Infested*, are not recognised disease occurrence categories by the Industry standard (DBCA, 2015).

#### 5.3 Current 2020/21 Assessment

The 2020/21 assessment reviewed all previously mapped infested areas and also included assessment of vegetation associated with historic positive sample recoveries including those not recorded in the 2016 PDMP (ELA 2016). Some refinement of the previously recorded Phytophthora Dieback status within the MAWR was required following the current assessment. The refinements are based on soil and tissue sample results supported by visual disease expression assessed by a registered and experienced Phytophthora Dieback Interpreter.

The infestation previously identified along the Western Power transmission line consists of several small spot infestations that are restricted to the swales between minor dune ridges. Visible disease expression extends approximately 900 m to the south of the MAWR northern boundary despite being previously mapped along the entire length of the transmission line within the MAWR.

The infestation previously identified along McKinley Road in the north of the MAWR is limited to a gully which is intersected by the road and appears to be associated with some historic site disturbance. Approximately 260 m of McKinley road has been classified as infested opposed to the 2.3 km which was previously mapped as Confirmed Dieback. The reclassified vegetation consists of dense *Banksia* woodlands and is clearly healthy with no visual evidence of Phytophthora Dieback impact.

A small area of infested vegetation was identified on the eastern boundary of the MAWR, in a creek line adjacent to the Muchea townsite and just south of McKinley Road. The infestation has been confirmed by a historic 2012 positive recovery supported by visual disease expression. This infestation was not previously identified (ELA 2016) but an Area of Concern was mapped upslope to the south. Most of this Area of Concern was found to consist largely of healthy vegetation that has been re-classified as uninfested. There is however a positive sample collected in 2018 from around the entrance gate situated at the end of Archibald Street which has been incorporated in the disease occurrence mapping presented in this PDMP (Figure 2b).

The infestation at the entrance gate opposite Archibald Street on the eastern perimeter of the MAWR extends westwards along the gravelled access track for approximately 1.4 km and there is another small infested area associated with a minor depression and another historic positive sample at the western end of the gravelled access track. It is likely that imported gravel associated with the access track is the source of the infestation and the entire track must be considered infested, even where there is no disease expression. Assessment of this area was limited to visual observation from the track as the areas is mapped as a former Rocket Projector Range with a risk of unexploded ordnances, and access was therefore not possible. The southern side of this track could not be assessed as it has been recently burnt and is classified as temporarily uninterpretable.

A new infestation has been identified on the southern perimeter in the west of the MAWR within the Civilian Firing Range buffer zone. The infestation covers approximately 100 m of the perimeter fire





break and extends north approximately 150 m into the vegetation, suggesting it has been present for a significant period of time.

The final infested area is situated approximately 1.3 km due west of the Small Arms Firing Range in the south of the MAWR. This infestation was identified in 2000 (VHS positive sample data base). Following an initial inspection of the site, very limited disease expression was identified and a soil and tissue sample collected during the 2020 survey returned a negative result. A subsequent, more detailed assessment of the VHS database identified that the spatial projection of the 2000 positive sample recovery was inconsistent with the locational co-ordinates from the original sample data, which located the sample approximately 200 m to the SW. Another on ground assessment was made of the revised sample site but again no disease expression was evident. There was, however, some vegetation decline in a near-by depression, which was sampled and returned a negative result for Phytophthora.

It is believed that the original sample location from 2000 is likely to have been recorded without the aid of GPS locational navigation aids and that the location data may be incorrect. As shown on the VHS database, other positive samples, also from 2000, were collected to the south of the MAWR. It is possible that the MAWR 2000 sample is associated with these and should also be external to the MAWR site. As a precaution, the sample site is shown on Figure 2b and the surrounding area has been classified as Not Yet Resolved. As the location is over 200 m from any open access track or other disease vector, it does not present a concern for Phytophthora Dieback Management across the MAWR.

Vegetation not classified as infested was assessed visually and in some locations soil and tissue sampling was performed, providing negative results for *Phytophthora*. In general terms these areas can be described as being highly interpretable for the presence of *Phytophthora* due to a high density of multiple susceptible species, including a number of *Banksia* species which are considered to be highly susceptible. While noticeable drought stress was observed across many areas, the vegetation was generally healthy and no areas of vegetation decline were found to exhibit typical symptoms associated with a Phytophthora infestation.

The 2020/21 assessment has collected visual evidence points and sufficient negative sample results to reclassify many of the areas previously mapped as Areas of Concern (ELA 2016). This includes a large area of mass vegetation decline/collapse in the south east of the MAWR. Two negative samples were collected from this area in 2020 (MAWR9 and MAWR10) and there have been multiple other negative samples collected from this area during previous survey. While the vegetation is obviously being impacted, the evidence is not consistent with impact by *Phytophthora* as there is no typical disease pattern, non-susceptible species are also being impacted and partial deaths were observed. Internal tissue material was observed to be discoloured with a green tinge which is also not typical of *Phytophthora* impact.

All areas previously mapped as Areas of Concern that are not classified as infested should not be managed as infested areas as this may result in potential hygiene associated with fire suppression or other activities incorporating uninfested vegetation with infested vegetation and compromising the protectability of large areas of protectable vegetation. While special management may be required for the area in the south east, described above, it is unclear if management consistent with Phytophthora Dieback will be effective, as the vegetation decline may be associated with neighbouring horticultural practices, aerially dispersed pathogens or chemicals which will not be controlled by soil movement restrictions.





As shown in Figures 2a and 2b, three areas have been classified as temporarily uninterpretable due to recent fire activity, which removes all visual evidence of disease expression. Two of these areas are associated with known infestations which has limited the mapping of the disease in these areas.





## 6 PHYTOPHTHORA DIEBACK MANAGEMENT PLAN

As defined in Section 2.3, Phytophthora Dieback management across DoD sites is managed under the National EMS with site specific controls and restrictions defined in the applicable RSO. Activities that do not involve soil movement and present a low risk of introducing or spreading Phytophthora Dieback may proceed under the direction of site specific RSO's and basic Phytophthora Dieback Management practices as presented in Section 6.2 below. Activities with a moderate to high risk of introducing or spreading Phytophthora Dieback, as defined in this PDMP, should be subject to further assessment and may require consultation with a Phytophthora Dieback management specialist to develop an activity specific PDMP.

#### 6.1 Objectives of the PDMP

The objectives of the PDMP are to:

- mitigate the risk of Phytophthora Dieback introduction into protectable areas; and
- mitigate the risk of spreading Phytophthora Dieback from existing infested areas.

#### 6.2 Basic Phytophthora Dieback Management

Basic Phytophthora Dieback management practices are suitable for application during general site access when performing low risk activities that do not involve soil movement. Basic Phytophthora Dieback management requires the standard of clean on entry (CoE) be applied across the MAWR. CoE is defined as the requirement for all vehicles, equipment, machinery and clothing including footwear to be clean and free from soil and or plant material prior to entering protectable areas of vegetation. Basic Phytophthora Dieback management practices include:

- no access to infested areas during moist or wet soil conditions.
- all personnel and site contractors to have completed biosecurity awareness training and are familiar with the requirement for operational hygiene to be assessed and applied with all disturbance activities within the MAWR. Basic Green Card training is a suitable standard of awareness training as is the requirement for operating on DBCA lands. A list of suitable Green Card training providers is available through the Dieback Working Group website.
- all external access points to the MAWR are considered CoE points. All vehicles, equipment, machinery and clothing including footwear are to arrive at the MAWR in a hygienically clean state that is free from all soil and plant material.
- the perimeter of all mapped infested areas represents a CoE location. Any movement of vehicles, machinery, equipment and footwear must be clean from soil and plant material when crossing from an infested area into protectable vegetation or any other area within the MAWR.
- where practical, no activities should be planned or undertaken in infested areas.
- where practical, all activities undertaken in remnant vegetation should be performed during dry soil conditions.
- avoid driving through areas where Phytophthora Dieback may persist such as low-lying areas, boggy creeks and puddles.





- carry mobile cleandown kits as defined below (Commonwealth of Australia 2015) for minor, unplanned hygiene compliance.
- report any observed breaches of hygiene to the Supervising Manager.
- when planning activities other than general access, a risk assessment to determine risk of introducing or spreading Phytophthora Dieback during activity implementation must be completed.

#### 6.3 Disease Risk

The risk of introducing and/or spreading Phytophthora Dieback is defined by the soil moisture at the time of an activity, the type of activity and the likely impact the disease would be anticipated to have in a specific area.

The primary source of Phytophthora Dieback introduction and spread is through controllable or uncontrollable disease vectors. Controllable disease vectors include human movement of contaminated soil, water and vegetation carried on vehicles, machinery equipment and clothing, including footwear. Uncontrollable disease vectors include movement of infested soil on animals including feral pigs and autonomous spread.

The risk of introducing Phytophthora Dieback is closely related to the soil moisture content at the time of the proposed activity, the nature of the activity and the consequence of introducing the disease on vegetation occurring in the area the activity is planned. These are further defined below.

#### 6.3.1 Soil Moisture

As Phytophthora Dieback spreads most readily in infested soil transported on vehicles, machinery, equipment and footwear, higher levels of soil moisture will increase the risk of disease spread as it increases the soil's capacity to adhere to these carriers. Soil moisture classifications are:

- **Dry** where dust forms when exposed soil is disturbed.
- Moist where soil is damp but does not stick to carriers.
- Wet where soil and moisture combine so that soil sticks to carriers.

The amount of rainfall required to influence the classification of soil moisture varies with soil type and therefore must be regularly monitored throughout an activity. Soils across the MAWR vary, but typically are very sandy which will decrease the likelihood of soils adhering to carriers with moisture.

#### 6.3.2 Activity Type

The likelihood of introducing or spreading Phytophthora Dieback is dependent on the availability of a source of inoculum and the nature of the activity. Variables that should be considered include the type of equipment used, area covered, access, need for imported materials, duration of activity and drainage from the activity area.

Activities that occur within Defence sites are separated into nine key groups (Ecoscape & Glevan 2012), some of which are considered high risk activities for the spread and/or introduction of Phytophthora Dieback as assessed by the Defence Environmental Risk Tool (DERT). All nine activity groups are considered relevant to the MAWR and include:

Construction / development

• Liquid waste management / disposal





- Demolition / decommissioning
- Maintenance
- Non-Defence activities
- Solid waste management / disposal
- Some example activities are provided in Table 2 below however this table does not represent a comprehensive list of all activities that may occur across the MAWR. When considering the likelihood of these activities introducing or spreading Phytophthora Dieback it is important to assume implementation of basic Phytophthora Dieback management practices. Soil moisture is not considered at this time.

Table 2; Example activities undertaken at the MAWR

Summary of activities across the MAWR				
Activity Group	Example Activity			
Construction/ Development	Road construction using heavy earth moving machinery operating for a period of several weeks across a long linear corridor. Importation of materials (e.g., gravel) required.			
	Construction of buildings and site facilities over several weeks or more, in areas adjoining and draining to protectable areas. Importation of materials and external contractor and equipment required.			
Waste Management	Onsite bunded storage in accordance with waste management guidelines. Waste collected and disposed off-site			
Maintenance	Road maintenance using graders and other machinery operating across long distances and potentially requiring imported gravels			
	Maintenance of buildings and site facilities requiring access via unsealed roads using rubber tyre vehicles (cars and trucks)			
Training	Use of firing ranges in cleared areas adjoining protectable areas			
	Troop movement on foot using firing ranges in bush settings classified as protectable vegetation			
	Troop movement in rubber tyred vehicles and machinery undertaking driver training activities			
	Troop movement in track machines across firing ranges in bush settings classified as protectable vegetation			
	Digging defensive positions			

As the assessment of likelihood assumes implementation of basic Phytophthora Dieback management practices, we assume the source of Phytophthora Dieback that could be introduced or spread will originate from:

• a hygiene breach associated with poor hygiene cleandown practice prior to clean entry into protected areas; or



- Site operations
- Storage
- Training



• an unknown infestation occurring within an area assessed as being protectable from the pathogen.

Therefore assessment of likelihood must consider the potential for each activity to experience a hygiene breach and the possibility for an undetected infestation to occur within the activity area. The level of likelihood is therefore directly associated with:

- the number of vehicles, machines and equipment;
- the size of the area involved; and
- the duration of the activity.

#### 6.3.3 Consequence of introducing Phytophthora Dieback

The consequence of introducing Phytophthora Dieback is based on the predicted impact of the pathogen in a specific vegetation type. This will vary with position in the landscape, annual rainfall and soil types. Table 3 below presents the predicted impact ratings and associated consequence ratings as defined in the PDMM.

Assessment for the consequence of introducing Phytophthora Dieback				
Predicted Impact Scale of Impact		Consequence Rating		
Very High > 50% overstorey will die		Severe		
High 10% to 50% of overstorey will die		Significant		
Moderate < 10% of overstorey and high numbers of understorey will die		Moderate		
Low No overstorey and minimal understorey will die		Minor		

Table 3: Predicted impact rating, assessment scale and associated consequence rating

As discussed in Section 5, occurrence of Phytophthora Dieback is limited by environmental conditions, especially rainfall. Due to the low average annual rainfall of the area, the occurrence of Phytophthora Dieback across the MAWR is anticipated to be limited to gullies and creek lines. However, the vegetation is dominated by highly susceptible *Banksia* species forming a woodland with limited overstorey. The identified infestations are exhibiting Moderate impact symptoms with occasional deaths of *Eucalyptus marginata* in the overstorey and high numbers of mid and understorey deaths. The Consequence Rating that would be associated with introducing Phytophthora Dieback into uninfested areas of the MAWR is Moderate.

#### 6.3.4 Calculation of Activity Risk

Tables 4 – 6 are adapted from the PDMM (DBCA 2020) and provide a risk assessment matrix based on activity likelihood of introducing the pathogen and the consequence of introducing the pathogen for each soil moisture classification. If an activity is anticipated to occur over a range of soil moisture conditions, then the worst-case scenario must be applied. Example: a construction program spanning 6 months is likely to include periods of activity occurring in wet soil conditions so the wet soil risk assessment table must be used to calculate activity risk.





Any activity that is considered to have a Moderate or High Risk rating is required to be subject to an activity specific PDMP developed using Phytophthora Dieback occurrence data developed through operational scale disease survey methods (DBCA 2015). The activity specific PDMP may require the implementation of a targeted comprehensive Phytophthora Dieback assessment of the activity site prior to activity to map the occurrence of the pathogen in the immediate vicinity and to identify site specific Clean on Entry (CoE) points. Completion of the activity specific PDMP and identification of CoE points will identify specific operational hygiene strategies designed to mitigate the risk of introducing Phytophthora Dieback to protectable areas. Clean on Entry is further defined in Section 6.4.

Low risk activities can proceed with the application of basic Phytophthora Dieback management principles which are defined in Section 6.2.

Phytophthora Dieback Risk Assessment for Activities in Dry Soil					
Likelihood	Consequence				
	Minor	Moderate	Significant	Severe	
Very Likely	Moderate	High	High	High	
Likely	Moderate	Moderate	High	High	
Possible	Low	Moderate	Moderate	High	
Unlikely	Low	Low	Moderate	Moderate	
Very Unlikely	Low	Low	Low	Low	

Table 4: risk matrix for activities performed in Dry Soil Conditions

Table 5: risk matrix for activities performed in Moist Soil Conditions

Phytophthora Dieback Risk Assessment for Activities in Moist Soil					
Likelihood	Consequence				
	Minor	Moderate	Significant	Severe	
Very Likely	High	High	High	High	
Likely	Moderate	High	High	High	
Possible	Moderate	Moderate	High	High	
Unlikely	Low	Low	Moderate	High	
Very Unlikely	Low	Low	Moderate	Moderate	





Table 6: risk matrix for activities performed in Wet Soil Conditions

Phytophthora Dieback Risk Assessment for Activities in Wet Soil					
Likelihood	Consequence				
	Minor	Moderate	Significant	Severe	
Very Likely	High	High	High	High	
Likely	High	High	High	High	
Possible	Moderate	High	High	High	
Unlikely	Moderate	Moderate	High	High	
Very Unlikely	Low	Low	Moderate	Moderate	

NB: from Section 6.3.3, consequence rating for the MAWR is Moderate

#### 6.4 Clean on Entry Locations

As defined in Section 6.2.4, disturbance activities with a Moderate to High Risk of introducing Phytophthora Dieback will require an activity specific PDMP, informed by comprehensive disease occurrence data for the subject area.

For the purposes of basic Phytophthora Dieback Management across the MAWR a series of CoE points have been developed and are shown on Figure 3. These locations include all external MAWR entry locations and the intersection of any roads and tracks traversing infested vegetation.

When accessing protectable vegetation across CoE locations all vehicles, machinery, equipment and footwear must be subject to a hygiene inspection by suitably qualified personnel to ensure the carrier is free from soil and or plant material. An example of a hygiene inspection form is presented in Appendix B. This form or suitable Department of Defence forms should be used to guide the inspection and provide evidence of appropriate implementation of this PDMP.

Any vehicles, machinery, equipment or footwear that fail the hygiene inspection when entering the MAWR must not be admitted to the site. Instead they must travel to the nearest clean down facility located at RAAF Pearce or other suitable commercial facilities in nearby towns.

If any vehicles, machinery, equipment or footwear within the MAWR fail the hygiene inspection when entering protectable vegetation from infested areas within the MAWR, they must remain at the CoE location and undergo effective clean down using a mobile clean down unit.

As a minimum, a mobile clean down unit will include the following (Commonwealth of Australia 2015):

- rectangular plastic tub with a lid (to carry items and to use as a footbath);
- stiff brush;
- newspaper to cover the foot well of vehicles (replace with clean newspaper regularly);
- dustpan and brush, possibly also a long-handled broom;





- plastic bag for sweepings and dirty newspaper;
- drum of water and sterilising solution, i.e. solution of 70% ethanol/methylated spirits in 30% water;
- 20% household bleach (with 5% active ingredient) in 80% water;
- quaternary ammonium disinfectant diluted according to manufacturer's directions;
- spray bottle containing sterilising solution (as above);
- alcohol wipes or gel for hands and personal items; and
- If plant vehicles require clean down inside an infested area, a mobile spray unit may be required.

All cleaning solutions will require appropriate labelling.

To avoid the requirement for clean down away from the RAAF cleandown facility or similar commercial facilities, there should be no access to infested areas in moist or wet soil conditions, as per the basic Phytophthora Dieback management procedures.

The requirement for clean on entry is provided in Table 7 below.

Table 7: requirements for undertaking hygiene inspections when crossing hygiene category boundaries.

Requirement for Hygiene Inspection				
Exiting Category	Entering Category	Hygiene inspection requirement		
Protectable Area	Infested	No		
(uninfested/uninterpretable)	Cleared area	No		
Infested	Protectable area	Yes		
	Cleared area	Yes		
Cleared area – No	Protectable area	Yes		
vegetation	Infested	No		

#### 6.5 Phytophthora Dieback Signage

The Standard Dieback Signage Protocol (Project Dieback 2008) presents standardised Phytophthora Dieback awareness signage across tenure. Signage consistent with this standard has been previously installed across the MAWR, however, some signage has been placed in accordance with the previous





disease classification system that is inconsistent with existing Phytophthora Dieback management protocols and methods.

A review of the previous signage has been undertaken and in some instances a relocation of signage is recommended. The revised signage locations are shown in Figure 3 and Figures 4a and 4b, however, the previous signage locations have not been included on the figures due to the scale of the figures and the volume of data.

#### 6.5.1 Dieback Protection Area Signs

Dieback Protection Area Signs identify the area as a site that is subject to management requirements that are informed by disease occurrence mapping. The signs are designed to be placed at site entry points and inform persons accessing the site that Phytophthora Dieback management practices are in place are required to be followed.

As shown in Figure 3, Dieback Protection Areas are recommended for all authorised access points. DoD should considered placing these signs at known unauthorised access points also, to inform unauthorised users of Phytophthora Dieback protocols for the MAWR.

These signs are to be placed at all main authorized access gates as shown on Figure 3.





#### 6.5.2 Dieback Status Markers

Dieback Status Markers are placed on roads and tracks traversing disease category boundaries to notify road and track users of disease status associated with different areas. Each status marker is to be placed on a disease category boundary so that a person travelling along the road or track will see the status marker that indicates the disease hygiene category they are entering. All protectable areas mapped as uninfested/uninterpretable as shown on Figures 2a and 2b should be allocated the Entering Dieback Free status marker until a detailed occurrence survey is undertaken in the area and evidence proves that Phytophthora Dieback is present in the area.







Plate 4: Dieback Status Markers





## 7 RECOMMENDATIONS

#### 7.1 Phytophthora Dieback Survey

- 1. All Phytophthora Dieback survey must be undertaken by a DBCA registered Phytophthora Dieback interpreter.
- 2. Future Phytophthora Dieback assessments must ensure all vegetation classified as temporarily uninterpretable in 2020 due to recent fire activity, is subject to detailed assessment in order to map disease extensions not identifiable in 2020.
- 3. All activities occurring across the MAWR that have the potential to impact remnant vegetation through either access, clearing or drainage must be assessed for potential Phytophthora Dieback risk. Activities with a moderate to high risk of introducing Phytophthora Dieback must be subject to an operational scale Phytophthora Dieback disease occurrence survey of the activity area and an activity specific PDMP may be required.
- 4. Phytophthora Dieback occurrence surveys must be undertaken in periods of suitable soil moisture. Suitable soil moisture is required to allow the recovery of the pathogen from soil and tissue samples during the laboratory analysis process. Suitable soil moisture is not precisely defined, however, periods following the break of winter rains or following significant summer rainfall events resulting in observable soil moisture are considered suitable times for conducting surveys.

#### 7.2 Signage

- 1. Current disease status markers are placed in accordance with inaccurate disease occurrence categories, resulting in situations where large areas of protectable vegetation may be managed as infested, potentially compromising the protectable status. All previous Dieback status markers are to be removed. Revised disease status markers are to be located in accordance with the disease occurrence data developed through the 2020/21 Phytophthora Dieback occurrence survey.
- 2. Dieback Status markers are to be placed on roads and tracks at the boundary of disease hygiene categories with the colour code for category being entered clearly facing all oncoming traffic. Example: a vehicle travelling through uninfested vegetation and approaching an infested disease hygiene boundary will see a red status marker indicating it is entering Infested vegetation. If travelling in the reverse direction it will see a green status marker. When passing a green status marker, the vehicle must stop and a clean on entry vehicle inspection must be completed. The vehicle can proceed once all soil and vegetation has been removed, if required.
- 3. As a minimum, a Dieback Protection Area sign is required to be placed at each authorised entry point to the MAWR. Consideration should be given to the installation of Dieback Protection Area signage at each point of unauthorised access to inform unauthorised users of the MAWR of the Phytophthora Dieback management protocols in place across the area.

#### 7.3 Basic Raw Materials

1. Currently Main Roads Western Australia are undertaking research into the ability of the pathogen to survive in BRM stockpiles that have been screened to remove all organic material. The results





of these studies are not currently available however a period of 2 years is considered current best practice. If imported BRM is to be stockpiled within the MAWR it must be stockpiled in a quarantine area that does not drain to protectable vegetation and must be allowed to stand free of organic material for at least 2 years.

- 2. Where practical, imported BRM should be sourced from an identified disease free source or a source that has been determined to represent a low risk of containing *Phytophthora*. Current best practice involves sourcing BRM from long cleared areas that have been free from organic material for considerable time. Such sites include agricultural land that is situated high in the topographic profile and away from high traffic areas.
- 3. Where possible, basic raw materials should be sourced from within the MAWR.

#### 7.4 Phytophthora Dieback Management

- 1. Archibald Road must be upgraded to remove pooling of surface water and wet soils from the road surface that can adhere to vehicles and machinery using the access/exit road. Archibald Road is infested and constructed from imported gravels that are the likely source of infestation. Current road condition is poor and presents a significant risk of infested soils being collected on vehicles and machinery.
- 2. Strict application of basic Phytophthora Dieback management practices must be incorporated into all MAWR activities and should be incorporated into the MAWR RSO.
- 3. All DoD staff involved in environmental assessment and management or staff overseeing on ground activities should undertake some form of biosecurity training. Formal bio security training is available through the Dieback Working Group Green Card program.
- 4. All external contractors performing work on DoD land should undertake some form of biosecurity training. Formal bio security training is available through the Dieback Working Group Green Card program.
- 5. All DoD requests for quote/tenders must clearly identify the requirements for application of strict Phytophthora Dieback management standards including the requirement for all equipment vehicles and machinery to be thoroughly clean before gaining entry to the MAWR.
- 6. The DoD must develop a process to ensure clean on entry standards are observed and maintained.
- 7. Unfenced areas of the MAWR should be fenced to restrict unauthorised access. Unauthorised access to the MAWR currently represents the highest risk of introducing Phytophthora Dieback into protectable areas of the MAWR.
- 8. Areas classified as temporarily uninterpretable in 2020/21 may potentially contain undetected Phytophthora Dieback infestations. These areas should be excluded from all future access and activity until post fire recovery allows the areas to be assessed for Phytophthora Dieback occurrence.





## 8 **REFERENCES**

**AECOM. (2011)** *Bindoon Defence Training Area Sustainability Monitoring and Reporting Plan.* Prepared for the Department of Defence.

**Blankendaal, P.A. (1998)** *Phytophthora cinnamomi infestation of up-land sites within three separate test areas of the Swan and Central Forest Regions.* Prepared for Department of Conservation and Land Management

Bureau of Meteorology (BoM) (2020) http://www.bom.gov.au/climate/data/

**Commonwealth of Australia (2018)** *Threat Abatement Plan for disease in natural ecosystems caused by Phytophthora cinnamomi* (TAP), Commonwealth of Australia.

**Commonwealth of Australia (2015)** *Arrive Clean, Leave Clean: Guidelines to help prevent the spread of invasive plant diseases and weeds threatening our native plants, animals and ecosystems.* Commonwealth of Australia.

**Department of Biodiversity Conservation and Attractions (DBCA) (2015)** *Phytophthora Dieback Interpreters Manual for lands managed by the department*, Perth.

**Department of Biodiversity Conservation and Attractions (DBCA) (2020)** *Phytophthora Dieback Management Manual*, Perth.

Department of Defence (2016) Environmental Strategy 2016 – 2036, Commonwealth of Australia.

**Ecologia (1998)** Flora and Fauna Survey of Muchea Air Weapons Range. Prepared for the Department of Defence.

**Eco Logical Australia. (2013)**. *Muchea Air Weapons Range Dieback Management Plan*. Prepared for the Department of Defence

**Eco Logical Australia. (2016).** *Muchea Air Weapons Range Dieback Management Plan.* Prepared for the Department of Defence

**Ecoscape & Glevan Consulting (2012)** *WA Regional Dieback Management Plan 2012.* Prepared for the Department of Defence.

Keighery, B.J. (1994) Bushland plant survey. A guide to plant community survey for the

community. Wildflower Society of WA (Inc.), Nedlands, Western Australia.

Project Dieback (2008) Standards Dieback Signage - protocols for use

file:///C:/Users/gsbio/Downloads/Dieback signage protocol 0.pdf

Shepherd, D.P., Beeston, G.R. and Hopkins, A.J.M. (2002) Native Vegetation in Western Australia: *Extent, Type and Status.* Technical Report 249. Department of Agriculture Western Australia, South Perth

**Strelein G.J., Sage L.W. and Blankendaal, P.A. (2006)** *Rates of disease extension of Phytophthora cinnamomi in the jarrah forest bioregion of southwestern Australia;* in Brasier C, Jung T & Oswald W (eds), Progress in research on Phytophthora diseases of forest trees: Proceedings of the 3rd International Union of Forest Research Organizations (IUFRO) working party S07.02.09 meeting, Freising, Germany, 11–18 September 2004, pp. 49–52, Forest Research, Farnham, UK.

**Woodman Environmental (2018)** *Muchea Exploration Program E70/4905 Flora and Vegetation Desktop Assessment,* unpublished report for Australian United Silica Corporation





## **9 REPORT DISCLAIMER**

This report was prepared for GHD on behalf the Department of Defence, solely for the purposes set out in the scope of works and it is not intended that any other person use or rely on the contents of this report.

Whilst the information contained in the Report is accurate to the best of our knowledge and belief, Great Southern Bio Logic and its agents cannot guarantee the completeness or accuracy of any of the descriptions or conclusions based on the information supplied to it or obtained during the site investigations, site surveys, visits and interviews. Furthermore, field and / or regulatory conditions are subject to change over time, and this should be considered if this report is to be used after any significant time period after its issue.

Great Southern Bio Logic and its agents have exercised reasonable care, skill and diligence in the conduct of project activities and preparation of this report. However, except for any non-excludable statutory provision, Great Southern Bio Logic and its agents provided no warranty in relation to its services or the report, and is not liable for any loss, damage, injury or death suffered by any party (whether caused by negligence or otherwise) arising from or relating to the services or the use or otherwise of this Report.

This report must be read, copied, distributed and referred in its entirety.





## **Figures**

Phytophthora Dieback Occurrence Survey

Department of Defence - Muchea Air Weapons Range





Muchea Air Weapons Range
 Declared Environmentally Sensitive Areas
 DBCA Managed Lands





Phytophthora Dieback Management Plan - Australian Defence Force -Bindoon Training Area prepared for GHD, June 2021

Great Southern Bio Logic does not guarantee that this maps without law of any this and taisdistify for any services. Joss or other consequence which may arise from relying on any information depicted.



0000159

00006†9

0000099 0009099 396000. MAWR5 0 391000. 386000.

**Survey showing Sample Locations** Figure 2a - Muchea Air Weapons **Dieback Occurrence Broad Area** Range - West - Phytophthora and Unprotectable Areas

- Status
- Broad Area Infested
- Temporarily Uninterpretable Broad Area Uninfested
  - Not Yet Resolved
- Z Unprotectable
- Sample Location & Result 2020/21
  - P. cinnamomi Negative
- **Historic Sampling**
- P. cinnamomi
  Positive (Phytophthora sp. unknown)
  - Negative
    - P. multivora
- Muchea Air Weapons Range





0000059

Phytophthora Dieback occurrence as at January 2021. Recheck required from January 2022.

Great Southern Bio Logic does not guarantee that this map is without flaw of any tind and disclaims all liability for any errors, loss or other consequence which may arise from relying on any information depicted.



396000.

391000.



Figure 2b - Muchea Air Weapons Range - East - Phytophthora Dieback Occurrence Broad Area Survey showing Sample Locations and Unprotectable Areas

- Status
- Broad Area Infested
- Broad Area Uninfested
   Temporarily Uninterpretable
  - Not Yet Resolved
- Z Unprotectable
- Sample Location & Result 2020/21
  - P cinnamomi
    - Negative
- **Historic Sampling** 
  - P. cinnamomi
- Positive (Phytophthora sp. unknown)
  - Negative
     P. multivora
- Muchea Air Weapons Range





Phytophthora Dieback occurrence as at January 2021. Recheck required from January 2022.

Contract J 2001. Great Southern Bio Logic does not guarantee that this map is without flavor any kind and disclaims all flability for any tentor. Joss or discret consequence which may arise from relying on any information depicted.



396000.

406000.

401000.

386000

391000.

396000.

401000.

Figure 3 - Muchea Air Weapons Range - Dieback Signage and **Clean on Entry Points** 

0000139

 Boundary Entry Sign
 Dieback Status Marker/Clean on Entry Muchea Air Weapons Range

0005059



0000059

Phytophthora Dieback Management Plan - Australian Defence Force -Muchea Air Weapons Range prepared for GHD, June 2021

Phytophthora Dieback occurrence as at January 2021. Recheck required from January 2022.

Great Southern Bio Logic does not guarantee that this map is without flavo of any kind and disclaims all liability for any errors. loss or other consequence which may arise from relying on any information depicted.

0009679





401000.

396000.

386000

391000.



0000159

0005059

0000059

0009679



0007099

Signage and Clean on Entry Points Figure 4a - Muchea Air Weapons Range - West - Infested Area

Boundary Entry Sign
 Dieback Status Marker/Clean on Entry

Broad Area Infested Broad Area Uninfested

Temporarily Uninterpretable
 Not Yet Resolved

Muchea Air Weapons Range Z Unprotectable



Phytophthora Dieback Management Plan - Australian Defence Force -Muchea Air Weapons Range prepared for GHD, June 2021

Phytophthora Dieback occurrence as at January 2021. Recheck required from January 2022.

Great Southern Bio Logic does not guarantee that this map is without faw of any kind and dischims all liability for any errors, loss or other consequence which may arise from relying on any information depicted.



391000



0009059

0007059

Signage and Clean on Entry Points Figure 4b - Muchea Air Weapons Range - East - Infested Area

 Dieback Protection Area
 Dieback Status Marker/Clean on Entry Plan - Australian Defence Force -Muchea Air Weapons Range prepared for GHD, June 2021 Phytophthora Dieback Management Muchea Air Weapons Range Temporarily Uninterpretable Broadscale Uninfested **GREAT SOUTHERN BIO LOGIC** Not Yet Resolved Z Unprotectable Infested Status

Phytophthora Dieback occurrence as at January 2021. Recheck required from January 2022.

Great Southern Bio Logic does not guarantee that this map is without flavo of any kind and disclaims all liability for any errors. loss or other consequence which may arise from relying on any information depicted.



399000.

401000

397000.



# Appendix A

VHS soil and tissue sample analysis report

Part of the second seco		Vegetatic He	alth Service - Ph	ytopht	thora -	mple informat	ion	27	EM046
CONTACT DETAILS o Name Jeremy Spencer Fax No. DPW Office or Compar	Phone Ny Name	No. 0400 113 093 GS Bio Logic	Job Type (Please indica Private	e 200	HA use or ate receive ate faxed DA(1) GD/	19431 12.20	SEND TO: Veg Ecosystem Hea & Wildlife, 17 D KENSINGTON Phone: (08) 9334 Fax: (08) 9334	etation Healt alth Branch – lick Perry Ave 6151 634 0317 0114	h Service, Dept. Parks
VHS Identification Number (VHS USE DMLY)	Sumple	Sample label Give location, eg. Forest Block of Shim, etc. and samplenumber)	r Plant species sampled	Site Impact (2)	Zone 50 or 51	Map Reference (3)	Land Tenure (4)	RESULT s/s root (5)	RESULT bait (5)
VHS 42146	14-12-20	MAWR 2020 Sample 1	B. attenuata		50	389562 6505001	other		CIN
VHS 42147	14-12-20	MAWR 2020 Sample 2	B. attenuata X. preissii	E	50	391950 6500891	other		TA
VHS 42148	14-12-20	MAWR 2020 Sample 3	B. attenuata	F	50	395282 6499581	other		NEG
VHS 42149	14-12-20	MAWR 2020 Sample 4	X. preissii		50	395285 6499219	other		NEG
VHS 42150	14-12-20	MAWR 2020 Sample 5	B. attenuata	F	50	395182 6498001	other		NEG
VHS 42151	14-12-20	MAWR 2020 Sample 6	B. attenuata X. preissii	F	50	395350 6497915	other		NEG
VHS 42152	15-12-20	MAWR 2020 Sample 7	B. attenuata	E	50	395301 6497587	other		NEG
VHS 42153	15-12-20	MAWR 2020 Sample 8	B. attenuata	F	50	396216 6497335	other		NHA

Please Note: a). NEG results cannot be used to represent a total absence of *Phytophthora* in the sampled area. b), Information from your samples will be incorporated into the VHS database and map products, which may be made available to the public and third parties to be used for insearch and other purposes. COMMENTS: Department of Defense - Federal Government - MAWR = Muchea Air Weapons Range

(JEX)		Vegetati - He	alth Service – Ph	ytopht	hora	Imple informat	ion		ORM M046
CONTACT DETAILS	Phone Phone ny Name	No. 0400 113 093 GS Bio Logic	Job Type (Please indica Private	e € G	IA use or ate receivante faxed	1612.20 194 31-12.20	SEND TO: Vege Ecosystem Heal & Wildlife, 17 Di KENSINGTON ( Phone: (08) 93 Fax: (08) 9334	elation Health Ith Branch -I ck Perry Ave 3151 34 0317 0114	Dept. Parks
VHS (dentification Number (VHS USE ONLY)	Sample Date	Sample label (Give lecalion, sg. Forest Block of Shire, etc. and samplenumber)	Plant species sampled	Site Impact (2)	Zone 50 or 51	Map Reference (3)	Land Tenure (4)	RESULT s/s root (5)	RESULT bait (6)
VHS 42154	15-12-20	MAWR 2020 Sample 9	B. attenuata	F	50	399335 6498965	other		NEG
VHS 42155	15-12-20	MAWR 2020 Sample 10	B, attenuota	F	50	399383 6498665	other		NEG
VHS 42156	15-12-20	MAWR 2020 Sample 11	B. attenuata	5	50	390428 6502206	other		CIN
VHS 42157	15-12-20	MAWR 2020 Sample 12	B. attenuata	E	50	400780 6501885	other		NAG
VHS 42158	15-12-20	MAWR 2020 Sample 13	B. attenuata	F	50	400779 6498633	other		NEG
VHS 42159	15-12-20	MAWR 2020 Sample 14	B. attenuata	-	50	397491 6497782	other		NEG
VHS 42160	16-12-20	MAWR 2020 Sample 15	X. preissii	F	50	398221 6504810	other		NEG
VHS 42161	16-17-20	MAWR 2020 Sample 16	B. attenuata		50	400328 6506296	other		NER

microllarise, CON = P. construita, NEC - negative, SUB = subcultured for further tests Please Note: a), NEC results cannot be used to represent a total absence of *Phytophthors* in the sampled area. b). Information from your samples will be incorporated into the VHS database and map products, which may be made available to the public and linit parties to be used for research and other purposes. **COMMENTS: Department of Defenso – Federal Government – MAWR = Muchea Air Weapons Range** 

FEM046
CONTACT DETAILS of sender       Job Type (Please indicate)       VHA use only       SEND TO: Vegetation Health Service.         Name_leremy_Spencer       Private       Private       Date received 12 + 5 · 2/       Ecosystem Health Branch - Dept. Parks         Serv No       Phone No 0400 113 093       Private       Date faxed 24 · 5 · 2/       Kensington 651
DPW Office or Company Name GS Bio Logic GDA(1) GDA 94 Fax: (08) 9334 0114 Fax: (08) 9334 0114
VHS Identification Number (VHS USE ONLY)       Sample Date       Sample label (Give location, eg. Forest Block or Shire, etc. and samplenumber)       Plant species sampled       Site Impact       Zone 50 or 51       Map Reference (3)       Land Tenure       RESULT sis root (4)       RESULT (5)
VHS         42846         5-05-21         MAWR 2021 Sample 17         B. attenuata         L         50         395146         other         NEG           VHS         42846         S-05-21         MAWR 2021 Sample 17         B. attenuata         L         50         395146         other         NEG



# Appendix B

Example vehicle hygiene inspection form



## Environmental Hygiene Inspection Check List

Vehicle/Machinery/Equipment DETAILS								
Inspection Date			Inspected By					
Vehicle/Machine								
Clean on Entry Location								
ITEMS Inspected: ✓ to confirm they have been inspected and are free of soil/vegetation or N.A if Not applicable								
Item/s	Yes	N.A	Item/s	Yes	N.A			
Suspension			Radiators/air vents					
Тгау			Engine compartment					
Wheels			Ground Engaging Tools					
Spare Wheel			Trays/Bumpers/Racks/Covers					
Mud Flaps			Screens/Belts					
Wheel wells			Chassis/Sub Frame					
Rock guards			Running Gear/Belly Plate					
Augers			Ladders Footsteps and Platforms					
Fencing wire and hardware			Machine bucket/ blade					
Tool boxes			Tracks					
All tools kept in vehicles and machin material	All tools kept in vehicles and machinery are also clean and free from soil and plant material							
Interior and any storage areas free o	of mud,	, soil ai	nd vegetation					
Equipment okay to enter/leave site	/proje	ct area	3					
Comments								
Inspected By								
Name Sig	gnature	2	Date					

